

ABSTRACT

A improved device and process for recycling spent nuclear fuels, in particular uranium metal, that facilitates the refinement and recovery of uranium metal from spent metallic nuclear fuels. The electrorefiner device comprises two anodes in predetermined spatial relation to a cathode. The anodes have separate current and voltage controls. A much higher voltage than normal for the electrorefining process is applied to the second anode, thereby facilitating oxidation of uranium (III), U^{+3} , to uranium (IV), U^{+4} . The current path from the second anode to the cathode is physically shorter than the similar current path from the second anode to the spent nuclear fuel contained in a first anode shaped as a basket. The resulting U^{+4} oxidizes and solubilizes rough uranium deposited on the surface of the cathode. A softer uranium metal surface is left on the cathode and is more readily removed by a scraper.